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ABSTRACT

The "ERIC Review" is published three times a year and announces research results, publications, and new programs relevant to each issue's theme topic. This issue is intended to help teacher educators, administrators, librarians, adult educators, and individual teachers introduce others to education resources on computer networks. There are nine articles including: (1) "Teaching Teachers to Use Telecomputing Tools" (Judi Harris); (2) "Classrooms Online: How One Teacher Got Started" (Bonnie L. Bracey); (3) "The Internet and Acceptable Use Policies: What Schools Need to Know" (Kay Day and Lynne Schrum); (4) "Network Terms to Get You Though the 1990s" (Barak Stussman); (5) "Federal Initiatives in Educational Technology" (Barbara Reuben-Powell and Carol Boston); (6) "Online with ERIC" which describes AskERIC, the National Parent Information Network, and other ERIC gopher and world wide web sites; (7) "Selected Resource Organizations" (Barak Stussman and Michael Heeg); (8) "Selected Reading List" (Carol Boston and Barak Stussman); and (9) "Putting It All Together: An Action Plan" which presents tips for using computer networks and a list of selected listservs. (AEF)

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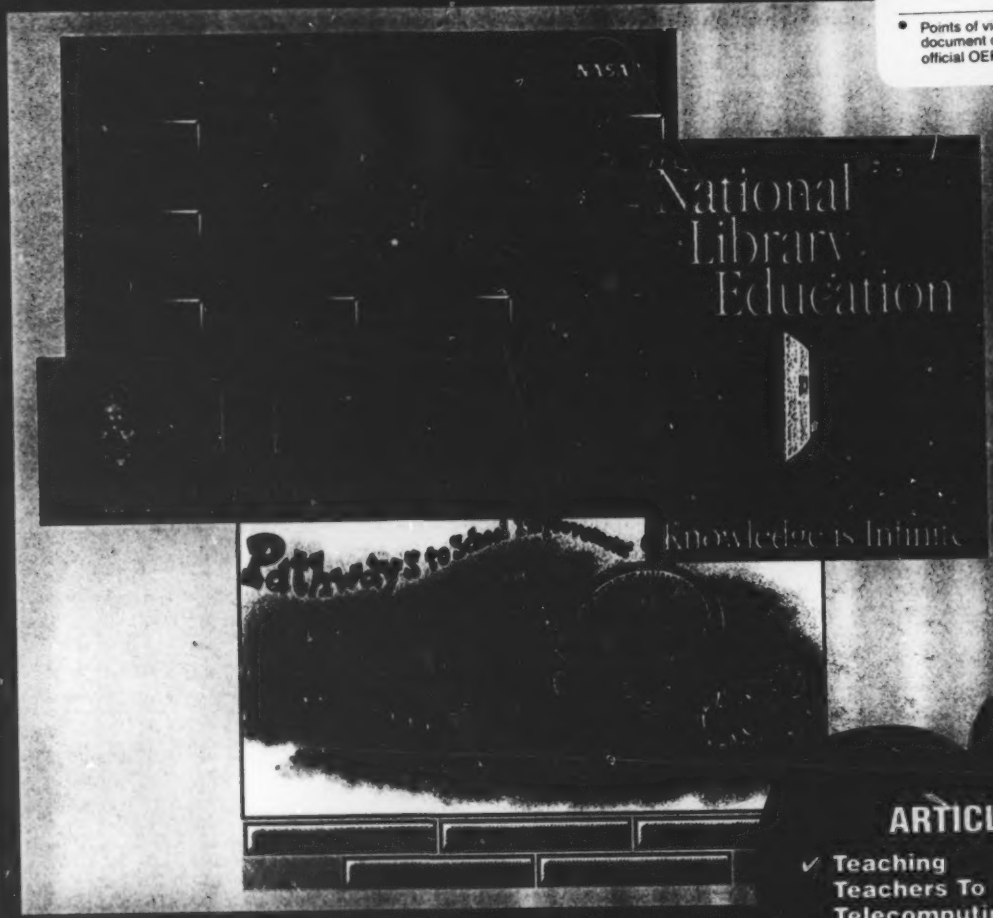
K–12 COMPUTER NETWORKING



Educational Resources Information Center

ARTICLES

- ✓ Teaching Teachers To Use Telecomputing Tools
- ✓ Classrooms Online . . . A Teacher Tells You How To Get Started

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An Important Message to Our Readers

In the three years since we first published an issue of *The ERIC Review* devoted to K–12 computer networking, interest in the topic has grown tremendously among educators, parents, and community members. ERIC's role as an information provider on the Internet and various online services has also expanded significantly. Each week, more than 500 people send e-mail to the AskERIC question-answering service; another 25,000 visit the AskERIC Virtual Library, the National Parent Information Network, and the subject-oriented Gopher and World Wide Web sites maintained by many ERIC Clearinghouses. And those numbers keep growing!

The National Center for Education Statistics estimates that nearly half of the nation's public schools have access to the Internet or another wide area network such as CompuServe, America Online, or Prodigy.[1] Sixty-seven percent of public schools have plans to implement or upgrade a wide area network.[2] Although connecting to the online world is an important first step, it's what you do when you get there that has the potential to improve teaching, learning, and education decision making.

This issue of *The ERIC Review* is intended to help teacher educators, administrators, librarians, adult educators, and individual teachers introduce others to education resources on computer networks. It includes information about how teachers can learn to use telecomputing tools, a first-person account about what happens when a teacher begins incorporating telecommunications in her classroom, and guidelines to help schools create policies for Internet use. You'll also find a glossary of network terms, reading and resource organization lists, an overview of federal telecommunications initiatives related to education, and complete access information for ERIC-sponsored network sites. Keep in mind that computer networking is a rapidly growing and evolving field: access methods improve and new sites open up all the time. This issue should thus be taken as a starting point rather than the final word on education-related networking. If a Gopher or World Wide Web address listed in this issue appears to have changed, please contact the host organization.

The materials in this journal are in the public domain and may be reproduced and disseminated freely. If you'd like more information about what the Educational Resources Information Center has to offer, details on how to access the database, or a referral to one of the 16 subject-specific ERIC Clearinghouses, please call 1–800–LET–ERIC, send e-mail to acceric@inet.ed.gov, or browse the ERIC system's new Web pages (http://www.aspensys.com/eric2/welcome.html).

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[1] References in this publication to commercial services or products are for information purposes only and are not to be construed as an endorsement by the U.S. Department of Education.

[2] *Advanced Telecommunications in U.S. Public Schools, K–12.* (February 1995). Washington, DC: U.S. Government Printing Office.

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The ERIC Review, published by ACCESS ERIC with support from the U.S. Department of Education's Office of Educational Research and Improvement (OERI), announces research results, publications, and new programs. It also contains information on the Educational Resources Information Center (ERIC), its subject-specific clearinghouses, and support components. The ideas and opinions expressed in this publication do not necessarily reflect the positions or policies of the Department of Education or OERI.

For more information about ERIC or a free subscription to *The ERIC Review*, call ACCESS ERIC toll free at 1–800–LET–ERIC.

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The Educational Resources Information Center is a nationwide information service designed to make education literature readily accessible.

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You can access ERIC at more than 3,000 locations around the world. Typically, university, state, and large city public libraries offer access to ERIC through their microfiche collections and online or CD-ROM searches. The ERIC database is also accessible through some computer networks.

In addition, documents selected for the database are abstracted and announced in ERIC's monthly journal, *Resources in Education*. The full text of most documents announced in ERIC is available in microfiche or paper copy from the ERIC Document Reproduction Service, 1–800–443–ERIC. ERIC announces journal literature in a separate monthly publication, *Current Index to Journals in Education*.

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Teaching Teachers To Use Telecomputing Tools

by Judi Harris

Are you a teacher's teacher? If you are traveling the information highway, chances are good that you are already teaching other teachers to use telecomputing tools, either formally or informally, or you are planning to do so soon. The Internet is a huge decentralized network of networks that currently serves more than 13 million users and encompasses more than 2.5 million hosts worldwide. It is growing at the rate of approximately 100 percent per year, changing literally minute to minute. To use the Internet for both professional development and instructional purposes requires constant accommodation to rapid change, successful use of varied interfaces, and tolerance for ambiguity. You can't teach these problem-solving skills, but you can assist in their development with appropriate instruction to willing participants. This instruction usually takes one of the following forms:

■ ***Independent Learning***. Many teachers have learned to use telecomputing resources with little assistance. Teaching yourself is probably the most time-consuming and frustrating way to learn networking skills, however, because of the highly ambiguous and changing nature of the Internet and the cumbersome characteristics of some of its procedures.

■ ***Independent Learning With Remote Assistance.*** Most teachers who currently use Internet tools have learned to do so by applying patience, persistence, and good problem-solving skills both independently and with help from more experienced network enthusiasts. This is the most prevalent, but not necessarily the most efficient, model for learning to use telecomputing tools.

■ ***One-to-One Coaching***. Some teachers are lucky enough to work with a more experienced "Internaut" who provides them with informal individual training. As communities of telecomputing teachers develop, this very effective learning model will become more commonplace.

■ ***Large-Group Demonstration With Independent Practice***. This model is often employed in the early stages of a school's or district's adoption of telecomputing innovations. Demonstrations of Internet resources and tools are typically made to large groups of teachers and administrators. This model is more effective for marshaling support from decision makers than for helping teachers to use the Internet.

■ ***Large-Group Demonstration With Assisted Practice***. This model, an improvement on the previous idea, can be effective both in convincing decision makers to support the infusion of telecomputing tools into education and in helping teachers to make use of these tools. However, it is generally not as successful as the following three models.

■ ***Hands-On Lab, Intensive Schedule.*** It is not surprising that teaching teachers to use new computer-mediated tools in a hands-on, collaborative context, in which brief demonstrations are followed immediately by assisted exploration of the procedures demonstrated, is often the most effective model for telecomputing training. Teachers' schedules, however, limit the time available for such hands-on experiences. This method often uses an intensive schedule (for example, several half-day or full-day sessions on Saturdays).

■ ***Hands-On Lab, Paced Schedule.*** Spreading hands-on training evenly over several months of Internet work is preferable to planning intensive labs because teachers can then practice what they learn before encountering the next new skill or resource type. It is difficult, though, to ensure that teachers finish between-meetings work, given the many professional and personal demands on their time. It helps to structure participants' expectations before they agree to begin training.

Judi Harris is on the faculty of the Department of Curriculum and Instruction, University of Texas at Austin. This selection is adapted from her "Mining the Internet" column in the October 1994 issue of *The Computing Teacher*, published by the International Society for Technology in Education.

■ ***Hands-On Lab, Paced Schedule With Structured Online Activities.*** Although this model is the most effort-intensive option for telecomputing trainers, it is often the most effective. If highly interactive, hands-on sessions offered at regular intervals in lab settings are supplemented by structured, motivating online activities that participants have committed to complete and be responsible for, online communities of networked teachers can emerge. Whether these communities continue to function after training activities end depends upon the extent to which participants truly adopt telecomputing innovations. The success of this training model in helping teachers develop transferable and longitudinal Internetworking skills can be seen in the growing popularity of online courses.

It is important to remember that different conditions of access, purpose, and support for telecomputing will greatly affect your choice of an appropriate training model. The models described above are offered as an array of possibilities, not as a hierarchy of recommendations. They are also admittedly unfinished. New models will emerge as more teachers and students learn to use the Internet. New tools will require new techniques for training, incorporated into new models of teaching and learning.

Tips for Teaching Teachers

Drawing upon my years of work with teachers who have learned to use Internet tools and resources for professional development and instruction, I offer the following tips on teaching teachers to use telecomputing tools.

■ Ensure teachers' access to telecomputing tools before attempting to teach them how to use these resources. If possible, provide easy access both at school and at home.

■ Provide teachers access to all types of Internet resources, including electronic mail, computer conferencing such as newsgroups or electronic

(continued on page 4)

Teaching Methods and Technology

The field of education is being influenced by a new understanding of how we learn and new applications of technology to teaching and learning. Allan Collins, a noted cognitive psychologist, has identified the following eight shifts in teaching methodology supported by research in cognitive psychology. Each of these changes can be facilitated by technology.

■ **A shift from whole-class to small-group instruction.** New research shows a dramatic decrease in teacher-led activities when computers are used, from 70 percent to less than 10 percent.

■ **A shift from lecture and recitation to coaching.** New research also shows an increase in the class time teachers spend serving as facilitators (rather than directors of behavior) when using computers, from 20 percent to 50 percent.

■ **A shift from working with better students to working with weaker students.** In traditional classrooms, teachers most often interact with brighter students who raise their hand; they frequently ignore slower students to avoid embarrassing them. With technology, that pattern is reversed; slower students receive two to four times more attention from the teacher.

■ **A shift toward more engaged students.** A number of studies have demonstrated that students who work with computers become more involved in their studies, often to the point of fighting over computers between classes and after school.

■ **A shift from assessment based on test performance to assessment based on products, progress, and effort.** Teachers have traditionally relied on end-of-unit tests for assessment. Technology shifts the focus of assessment from tests to progress on projects and to the final product of students' efforts.

■ **A shift from competitiveness to cooperation.** A number of researchers have noted greater mutual assistance among students when using technology.

■ **A shift from all students learning the same things to different students learning different things.** A number of studies have shown how technology can support students as they tackle various parts of a complex project, each contributing to a larger final product. Technology helps students maintain focus and manage information as they work on separate aspects of a problem.

■ **A shift from the primacy of verbal thinking to the integration of visual and verbal thinking.** Visual media—television, film, and computers—are beginning to compete with abstract text as the primary means of learning in our day. Lectures, multiple-choice tests, and recitation of knowledge become less relevant when technology-based alternatives are available.

Many teachers go through identifiable stages on their way to becoming experienced technology users. In the early stages, they use computers to support traditional methods of teaching such as drill-and-practice, text orientation, whole-group lectures, and seatwork. Later, as teachers gain confidence, they use technology as part of more innovative instruction, including team teaching, interdisciplinary project-based instruction, and individually paced instruction. Finally, they enter an inventive stage in which they experiment and change, using technology to support active, creative, and collaborative learning.

From *Technology Making a Difference: The Peakview Elementary School Study* (1994) by Brent G. Wilson, Roger Hamilton, James L. Teslow, and Thomas A. Cyr. Syracuse, NY: ERIC Clearinghouse on Information & Technology.

bulletin boards, direct Telnet connections to remotely located information resources, file transfer capabilities to and from anonymously accessible file archives on the Internet, Gophers and related tools such as Veronica, and, if possible, World Wide Web tools such as Netscape and Mosaic (multimedia) and Lynx (text only).

■ Use a telecomputing trainer who is part of the existing social system of the school or district. Make sure he or she is available for ongoing, long-term support of telecomputing adventures and is seen as a colleague rather than the local computer guru.

■ Introduce new users to electronic mail (for private or small-group communications) and computer conferencing (for public and large-group communications) first. Although as a trainer you may be most excited about getting information resources into the hands of your teacher-students, remember that they may feel most comfortable using those tools that most closely resemble communication forms with which they are familiar, such as the letter and the bulletin board or committee meeting. Also, it is important that new telecomputing teachers understand the most efficient uses of differing tools so that they will use those tools appropriately.

■ Introduce Gophers, Telnet sites, FTP archives, and World Wide Web tools later, as interests dictate. Remember that teachers' successful use of telecomputing tools will be highly individualized and reinvented. There is a much better chance that teachers will use Internetworked tools and resources in powerful and ongoing ways if they are ready to use a new technique when you introduce it and are motivated to use it for self-determined purposes.

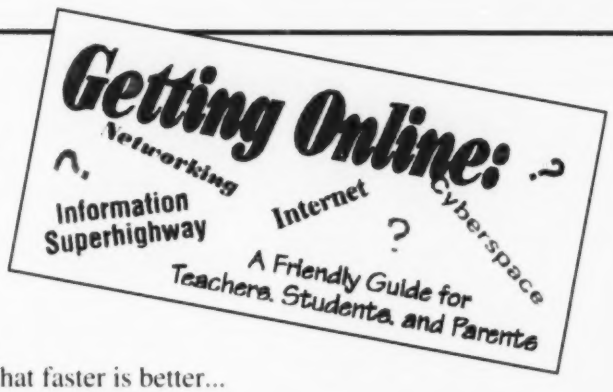
■ Make clear, friendly, paper-based, user-developed documentation amply available to trainees. There is no better teacher (or document writer) than another, slightly more experienced teacher. Be cautious of adopting documentation written by technical specialists and be willing to coordinate the ongoing revision and updating of participant-created documentation.

■ Provide structured, enjoyable online activities for practice of skills learned in face-to-face, hands-on sessions. Remember that adults are receptive to playful learning environments.

■ Fully support those teachers most motivated to explore the Internet, allowing use to grow in grassroots patterns. At the same time, do not mandate participation in telecomputing training sessions. Make sure that there is support from your school, district, and state decision makers.

At a minimum, you'll need the following to access a network:

- A personal computer,
- A modem,
- Communications software, and
- An account with a network provider.



The important thing to know about modems is that faster is better...

For more telecommunications basics, call 1–800–LET–ERIC to request a free copy of *Getting Online: A Friendly Guide for Teachers, Students, and Parents.*

THE ERIC Review

Classrooms Online: How One Teacher Got Started

by Bonnie L. Bracey

I have been working online from the classroom for several years. My initial online experience came in a program sponsored by the U.S. Department of Education that linked teachers in the Washington, D.C., area with each other and with other teachers learning how to use technology in other parts of the country. The host computer was at Stanford University in Palo Alto, California. We sent a few messages back and forth to other schools. One school sent us an impressive graphic holiday message.

Teachers in my school were excited and felt very special to be able to participate in the program. At the time, we had a school account rather than individual accounts. Because most of our computer work was done in the library after school, we did not get much online experience.

First Classroom Application

After sending e-mail to other teachers, I began investigating classroom applications. My next involvement was with the National Geographic Kids Network, a telecommunications program that features real science, geography, history, statistics, and math applications. I had been participating in a summer institute at National Geographic, and I had access there to a room to try out software. I had never before had the opportunity to just learn and work with a program on my own time.

After training, I signed up for the Kids Network "Hello" program, an introductory program based on local geography. The program gave students and teachers time to get online and get familiar with all the icons. I started with gifted and talented students in a 4th- and 5th-grade combination class. We had to know the longitude and latitude of our communities, and we developed an outline to describe them. I quickly instituted peer tutoring and used some stations to distribute information about maps and the geography of our city, Arlington, Virginia. I gathered every kind of map I could find to share with the students, along with resource materials about the region. I also secured an atlas for each student and visited the U.S. Geographical Service to get topographical maps and additional information about Arlington.

Using these resources, the students did "mind maps," or idea explorations of Arlington, and prepared drawings of their routes from home to school. I wanted to see what they considered significant enough in their neighborhood and community to show to others. This approach personalized the lesson—typing and thinking about their home community shook off my students' lethargy. It was neat to have them calling the Chamber of Commerce, collecting newspaper items, and asking questions of parents and friends. Children using the networks for the first time had a goal that could be easily accomplished and help was right at their elbow. I would sometimes see little faces glued to the windows as the class worked. Some students came in and did the work even though they were students in English as a Second Language (ESL) classes.

When I first saw the Kids Network "Pets" program, I was not very interested. I thought it was too simplistic. Boy, was I wrong. When I had a chance to try the program myself, I discovered that it was easy to use, had well-written lessons, and could be personalized. I decided to try it in the classroom.

We defined and talked about all kinds of pets. We learned that some people in the country had peacocks and goats for pets. We heard from a class in Vancouver about a cougar that had to be shot because it was trapped in a woman's bedroom. Then, so soon, the

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At the time of this writing, Bonnie L. Bracey was an elementary teacher in Arlington, Virginia. She is now helping other teachers adopt technology in the classroom through her position at the Arlington Career Center. In 1994, she was selected as a member of the National Information Infrastructure Advisory Committee.

telecommunications time was up, and after that, something was missing in our instruction.

The kids prepared wonderful portfolios that included letters, data charts, graphs and statistics, creative writing, and art. They organized their own folders, adding pictures or poetry, the characteristics of various types of pet owners, cartoons, and very detailed essays about pets. We even added pet songs to our plate of things connected with the network program. This type of learning was very interesting to them. Even when we went off line, some students continued to use the software to learn more, to write, to print out maps, and to create documents and graphs.

Effects on Students

Our second National Geographic Kids Network program was on acid rain. It was during this unit that I found out how much the students enjoyed the empowerment and interaction the network gave them. When it was time to move on to a new topic, the students were not interested. They wanted to pursue the acid rain issue, so we arranged our science fair to be mostly about projects on pollution and acid rain.

When we moved to a class project called Future Think on Prodigy, we entered a writing contest. Benj, then a candidate for special education based on a motor disability for writing and problems following through on projects, decided to write about acid rain. I remember thinking that acid rain was probably not quite the topic they wanted, but Benj wove the tale, wordsmithing his concerns for the future so well into the essay that I did not say a word. He worked and worked on the document. I even got excited about it. After awhile, though, I stopped thinking about the contest. After all, teachers and kids enter lots of contests. Then the announcement came—Benj had won second place in the country. The contest was not restricted to elementary students, so the award was a powerful statement of Benj's ability to write. He chose as prizes a computer for himself and one for me, the very one I write on now.

I signed up for and got all the available Kids Network projects, and we continued to do "real" science. We even translated the Kids Network packages into Spanish. Occasionally, I got in trouble because students would not want to leave the classroom to go to their ESL or instrumental music classes, but the other teachers supported what I was doing and we worked the problems out.

"Going online in the classroom changed me as a teacher. I was no longer the authority, I was a colearner, and the students seemed to respect me even more and to love learning."

Effects on the Teacher

A classroom like mine is not your typical row-oriented classroom. The motivating factor for our seating is the learning that will be taking place. No one sits silently. No one pretends to be participating while dreaming of the time for the bell. In fact, I sometimes have to ignore all kinds of little pleas from students who want to come in ahead of the group to do special things on the computer. But because we have a lot of students who are in the building from 7 a.m. to 7 p.m and have their homework time squeezed, I sometimes let them come in early to do research online.

Going online in the classroom changed me as a teacher. I was no longer the authority, I was a colearner, and the students seemed to respect me even more and to love learning. In this type of teaching, we made big steps, decisions, and mistakes together. It built a community of learners.

A Sample Lesson in a Wired Classroom

I start my typical day in a "wired" classroom by checking out all the machines. I set the stage for learning and make sure the materials the students need for the day's work are in place or photocopied.

I try to integrate the subjects I teach in thematic units. For example, I've used the Jason project from National Geographic, Electronic Data Systems, and the National Science Teachers Association, which combines core curriculum from the social studies, science, and geography with telecommunications work and experiments. I like to create an enriched atmosphere by weaving together books, centers, software, and multimedia presentations. If hands-on materials are available, I add them.

For the Jason project on Belize (a country in Central America bordering on the Caribbean), I asked a parent to videotape relevant programming from the Discovery Channel and used some lessons on the Maya from *Voyage of the Mimi*, an educational show. I got posters from the embassy and borrowed a tarantula and a scorpion (not live) from a colleague in the junior high. I displayed a collection of coral on a vibrant, ocean-patterned piece of cloth. The learning centers were stocked with rocks and minerals typical of Belize's topography (irregular limestone with sinks, underground streams, and caverns), as well as with coral reef posters and samples, books, and software. We made collages of coral reefs, the Maya, and neotropical rainforests, and incorporated creative writing and additional hands-on projects.

Students kept track of what had been accomplished on a chart. They put red stickers on the chart to get help, tutoring, or answers to special questions. The children particularly enjoyed an activity involving two fruits that allowed them to be neotropical botanists. They described each fruit's appearance and drew pictures of it, then cross-sectioned and longitudinally sectioned it. They also counted seeds, weighed the fruit, made the identification in a resource book, and tasted it. The "Plants" program from the National Geographic and the "Amazon Trail" program from the Minnesota Educational Computing Consortium were available on computers for groups or individuals to use.

While conducting these activities and experiments, we talked to other classes online about what we were doing. We sometimes accessed Learning Link from the Public Broadcasting Service (PBS), for example, and went online to show what we were doing and to find out what experiments others were doing. Sometimes we shared our writing, our concerns, and our disappointments. For example, during the fruit activity, the kids were not enamored of the papaya, but the students to whom they were writing told them ways to prepare it and how it is used in ethnobotany. An Earthwatch participant told them how she gathered papayas from the yard of the home in which she was working.

To support my online classroom, I've also used our state network, Virginia's PEN. I have driven all over the state with friends to help teachers learn to access Virginia's PEN, and I use America Online, mostly because there are lots of people who have not forded the creek to the Internet and I want to be in touch with both audiences.

Getting Started on the Internet

While on Prodigy, I often observed long discussions about the Internet and would participate in them, but when I asked how to gain access to the Internet, no one could tell me. Maybe they didn't want to tell me that I would have to pay for it or know someone to get a free account. I was not in touch at the time with university people or taking a course at a university, so access was going to be a problem. Virginia's PEN was what was offered in my area without cost, so I did not make further inquiries about the Internet, especially after someone told me it was for university types. I had noticed that the business cards of most university people had an Internet address. I figured it was a perk.

I also thought using the Internet would be hard. A friend of mine who was a Christa McAuliffe educator used the Internet. He was so interested in it that once he got on, he was essentially not in the same room. I mean he was there, but gone. I knew all the wonderful things he was doing, but I did not have a clue as to how to start myself. Words like NASA's Spacelink and Gophers were in my vocabulary, but I still did not have access. Jim would show me what really great opportunities the Internet offered, and he provided a book to help me, but I needed an account. I finally got one when I was appointed to the National Information Infrastructure Advisory Committee.

In all grades K through 12, there are constant interruptions from the loudspeaker, from people wanting access to your classroom, from students and parents who have questions, and from children walking in and out for specialized lessons. While I was learning the Internet, there was a new schedule on top of that. I decided to learn in the quiet of my living room.

Soon I also got a Learning Link account; I was on and exploring in just a few minutes. In a meeting at PBS, I heard someone say how much Learning Link was like the Internet. I immediately went home and tried the Internet. I was doing e-mail in less than 5 minutes. I started gophering after the e-mail fun ran out and then tried other types of access. I made

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Getting on the Internet

If you want to gain access to the Internet—the worldwide network of computer networks that includes thousands of databases, discussion groups, and files on every topic imaginable—you'll need to set up an account with an Internet provider. Possibilities range from getting a free account if you're a student at certain colleges and universities to signing up with a commercial online service that will charge you either a flat monthly fee or an actual online usage fee. Here are some places to try first:

- A local college or university.
- The public library.
- The state board of education or school district (if you're a teacher) or other place of employment.

If you're not able to obtain an Internet connection through one of these institutions, you might try:

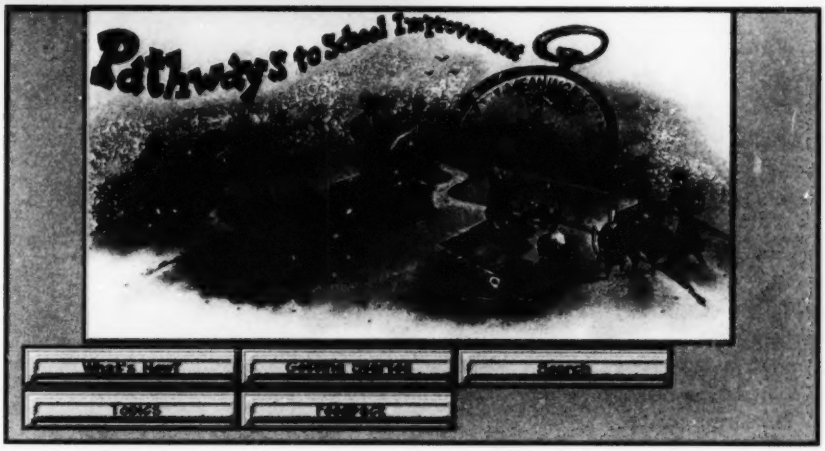
- Talking to people at your local computer store.
- Browsing through a computer newspaper, often available for free at computer stores.
- Getting a copy of "The Public Dialup Internet Access List" (PDIAL). If someone you know has e-mail, send a message to info@pdial.com, with the body of the message stating "Send PDIAL."

Some of the commercial networks such as America Online, Prodigy, and CompuServe provide full or partial access to the Internet in addition to their own offerings, which include reference services, online publications, online chats, software and games, and travel planning. Many users also find commercial services more attractive, friendlier, and easier to use than direct connections to the Internet. If all you want is access to the Internet, you can probably obtain it more economically using one of the methods above. But if you're also interested in the many other resources available through commercial services, the Internet access you receive from them may be a nice plus.

Classroom Resources on the World Wide Web

◀ NASA Spacelink
http://spacelink.msfc.nasa.gov

North Central ▶ Regional Educational Laboratory's Pathways to School Improvement
http://www.ncrel.org/ncrel/sdrs/pathways.htm



some mistakes, but in general people were helpful.

I went back to school and showed the kids. We immediately added the Internet to our classroom technology. Chipper in Nevada became our expert on space science education and Mars. We used NASA's Spacelink so much I was expecting a bill. Fortunately, it is free. It really rounded out our access to knowledge about space. Online, Chipper guided us to studies about Mars. Alex, a 4th-grader in my classroom, wanted to know how he was going to take hamburgers into space. We talked to Chipper about cloning and the transport of embryos into space, and Alex was quickly in touch with a futurist in England who was studying the same problem.

Partners in Learning

I made another large leap when I was given access to the computer labs at George Mason University. Lab staff created a university environment that allowed teachers to be a part of their learning about ways in which educators use technology. We began to use Mosaic, CUSEEME, MUDs (multiuser dungeons for online roleplaying), and other applications. Given school meetings, parent contact, and classroom responsibilities, I think teachers need inclass time or other released time to learn. This year, I'm taking an Internet course. I've also continued to talk online with the parents who were adventurers with me in the learning process. These parents knew the Internet from work, and they helped me. When parents, teachers, and students work together and share, it creates an avenue to help make change.

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THE ERIC Review

The Internet and Acceptable Use Policies: What Schools Need To Know

by Kay Day and Lynne Schrum

Stories abound about students using the electronic superhighway to actively engage in the learning process and teachers using it to communicate with their colleagues. Educators at many schools dream of the day when they will be fully connected to the Internet for professional and curricular activities. However, the prospect of students having open access to unrestricted materials concerns many parents, educators, and community members.

One of the most serious concerns seems to be protecting children from being exposed to or finding inappropriate material. Another concern is protecting the schools from litigation arising from inappropriate use of the Internet. As Fishman and Pea (1994) note, "Since the Internet was not designed with children in mind, many potentially difficult issues must be discussed by both the education and the Internet community" (p. 1). It is the school's responsibility to determine "what safety, liability, and, above all, educational concerns must be addressed before the schools are ready to tap into the Internet" (p. 2).

To address these concerns, schools need to establish policies for the appropriate use of computer networks. An *acceptable use policy*, or AUP, is "a written agreement signed by students, their parents and their teachers outlining the terms and conditions of Internet use—rules of online behavior and access privileges" (Keeping Students, 1995, p. 12). This article examines current trends in developing and implementing AUPs and provides recommendations for schools interested in developing their own policies.

Components of Effective AUPs

Some schools create AUPs before problems surface; others do so only after concerns arise about the appropriate use of the Internet by students. By reviewing literature and interviewing educators who have developed AUPs, we have identified a number of issues that AUPs should address:

■ **Definition of the Internet**. Educators should not assume parents know what the Internet is (Keeping Students, 1995). The education community must bear the burden of informing parents about the Internet and all of its capabilities, both good and bad.

■ **Netiquette**. Just as every school provides a code of conduct governing the behavior of its students, schools with access to the Internet must establish rules to guide students in interacting with others via the computer. A computer network etiquette, or "netiquette," has evolved among users. Rinaldi's *The Net: User Guidelines and Netiquette* (1994) is often cited as a standard in the area of online behavior.

■ **Ethical and Legal Issues.** Both principles of right and wrong and legal issues arise in relation to networks, particularly intellectual freedom and copyright. Schools have been guiding their students on the issue of copyright for print materials for many years. There is a continuing debate, however, concerning copyright protection in the realm of electronic transmissions. Because the Internet is a fluid environment, "it is impossible to predict with certainty what information students might locate" (Minnesota Coalition, 1994, p. 1). The recommendation most frequently made is that schools continue to follow fair use and software reproduction guidelines until there is a "change in the U.S. copyright law aimed at providing greater protection for copyrighted information that can be

(continued on page 10)

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accessed electronically" (Henderson, 1995, p. 56).

As this area of technology has developed, many legal issues have evolved that have not yet been tested in the courts. Groenewold (1994) indicates that some of the troublesome areas will be property rights; mischief and criminal activity such as viruses, worms, and hacking; censorship; security; and commercialization. Stager (1993) notes that "educational institutions are struggling to word their network use policies so as to accommodate First Amendment rights while upholding their responsibilities to maintain a non-intimidating environment" (p. 42).

In this context, it is important to inform students that electronic mail cannot necessarily be considered private communication. Ultimately, the school has the technical ability to back up electronic mail and the ethical responsibility to maintain order and to respond to complaints from other users. School staff would be wise to confer with their legal advisors and to examine state codes when writing an AUP to ensure compliance with current laws.

■ **Objectionable Material.** Just as certain print materials offend some people, so too may some of the materials available on the Internet. As Proctor (1994) notes, "Like other forms of publishing, materials that appear on the network may be judged as pornographic by some users" (p. 26). According to one handbook, it is for this reason that schools develop clear policies regarding Internet use. When developing these policies, schools need to "exercise reasonable oversight while realizing that it is almost impossible to absolutely guarantee that students will not be exposed to objectionable materials" (Protheroe and Wilson, 1994, p. 26). Many schools have already developed a procedure for dealing with objectionable materials within their media selection policies, and this procedure could be extended to cover the use of the Internet.

■ **Privilege Instead of a Right.** Another essential component of an AUP is the inclusion of a clear statement that access to the Internet is a privilege and not a right, and a warning that if a student violates any rule, certain consequences will follow. Connolly and Webster (1993) report that the policy statements of many districts and institutions "treat computing as a privilege so as to more easily enforce rules surrounding its use or abuse by the threat of revoking the privilege." (p. 30).

■ **Penalties and Repercussions.** Students and parents need to be aware of any penalties or repercussions—such as warning letters, loss of Internet access, financial restitution, or legal action—that will be incurred for failing to abide by the AUP. States have varying laws, but typically those convicted of certain computer-related crimes face fines and/or imprisonment. The AUP must be explicit in addressing these issues to preserve students' right to due process and to protect the school from litigation.

Once a student and parent have read the AUP, they should be required to sign a form stating that they have read and understood the items included. The school should retain these forms as a binding document (Keeping Students, 1995).

Recommendations for Developing an AUP

It is clear that the implementation of AUPs is at an early stage. The AUPs we reviewed generally addressed the issues previously mentioned and also reflected the schools' unique codes of conduct and community values. AUP developers recommended that school personnel implementing AUPs use policies from other schools as guides

The Ten Commandments of Computer Ethics

1. Thou shalt not use a computer to harm other people.
2. Thou shalt not interfere with other people's computer work.
3. Thou shalt not snoop around in other people's files.
4. Thou shalt not use a computer to steal.
5. Thou shalt not use a computer to bear false witness.
6. Thou shalt not use or copy software for which you have not paid.
7. Thou shalt not use other people's computer resources without authorization.
8. Thou shalt not appropriate other people's intellectual output.
9. Thou shalt think about the social consequences of the program you write.
10. Thou shalt use a computer in ways that show consideration and respect.

Source: Computer Ethics Institute, © 1992.

and talk to people in schools where policies are in place to see what has or has not been effective.

AUP developers further advised that the AUP be in place before students are allowed Internet access, that it be concerned with students' intellectual freedom, and that the developer engage the school board and staff in a discussion about its implications. They also suggested that the policy use simple terminology, allow for flexibility in responding to varying degrees of misuse, maintain a positive tone, and take into account a community's values. The AUP developers also advised schools to provide guidance or tutorials to students in the proper use of the Internet.

On the basis of our literature review and survey of AUP developers, we would suggest keeping the following procedural steps in mind when writing an AUP:

- The school should appoint an individual to gather information and write a draft AUP, searching the Internet for relevant materials and examining other schools' AUPs.
- The school should form a committee to review and revise the draft. The committee should have representatives from the district office and the schools, and it should include teachers, media specialists, and computer technologists.
- The policy should be reviewed by people outside of the committee, including the school board attorney. The school board may want to adopt the AUP formally as one of its policies.

Schools today are challenged to meet the demands of a changing society, which includes giving students and staff access to information technologies. A carefully crafted AUP can prepare schools to address the issues involved with introducing students to these technologies.

"Schools today are challenged to meet the demands of a changing society. A carefully crafted acceptable use policy can prepare schools to address the issues involved with introducing students to these technologies."

Readers are encouraged to browse the material at Gopher: **riceinfo.rice.edu**. Information is available by subject area, education level, and acceptable and unacceptable uses of net resources (K–12). You may follow the same path on the World Wide Web at URL: **http://riceinfo.rice.edu**.

References

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Proctor, L., and A. Allen. 1994. *K–12 Education and the Internet*. East Lansing, MI: National Center for Research on Teacher Learning. ED 373 798.

Protheroe, N., and E. Wilson. 1994. *The Internet Handbook for School Users*. Arlington, VA: Educational Research Service.

Rinaldi, A. 1994. *The Net: User Guidelines and Netiquette* [Online]. Available: FTP: ftp.virginia.edu Directory: /pub/IRD/netiquette.txt

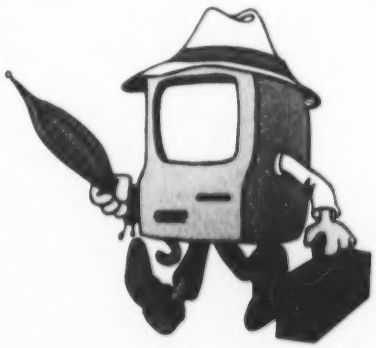
Stager, S. 1993. "Individual Rights Versus Institutional Responsibilities." *Educom Review* 28 (3): 41–44.

Technological Literacy: Comprehension of technological innovation and the impact of technology on society—may include the ability to select and use specific innovations appropriate to one's interests and needs.

—From *The Thesaurus of ERIC Descriptors*, 13th Edition
The Oryx Press, 1995

THE ERIC Review

Network Terms To Get You Through the 1990s



Like any field, computer networking has its own terminology. Listed below are brief definitions of commonly used terms.

About the Hardware and Software

Bandwidth—a measure of how much information a communication channel can carry. (If you imagine information flowing through a tube, the diameter of the tube would be the bandwidth.) It requires greater bandwidth to transfer sound and graphic images through a network than to transfer data.

Bps—bits per second; a measure of data transmission speed. **Modems** typically transmit data at 2400 bps, 9600 bps, or 14.4 kilobits per second.

Client—a program that enables users to access an information service. A client communicates across a network with the appropriate **server** and displays results.

Communications software—a program you install on your computer to enable it to exchange information with another computer via a **modem**.

File server—a specially equipped computer that contains files and data that can be used by everyone connected to the **network**.

Gateway—a computer on a **network** that is used to send a message from the network to a distant computer.

Modem—the equipment used to link a computer to a telephone line. A modem may be internal to the computer or a separate piece of hardware.

Network—a group of interconnected computers that can communicate with each other. Computers on a local area network (LAN) are on the same floor or in the same building, are directly connected to a **file server**, and share equipment such as printers. Wide area networks (WANs) link computers or LANs over a greater distance. Computers may be wired directly or have remote, dial-up access to a network **node**.

Node—a powerful computer to which other computers are linked in order to gain access to the **Internet**. Personal computers typically dial in to a node via a **modem**. Internet nodes may be located at colleges and universities, research institutes, libraries, state departments of education, and private companies.

Server—a program on the information side of the network that retrieves items and transmits the results to **clients**.

About Electronic Networks and Services

Bulletin Board System (BBS)—electronic versions of hallway message centers, bulletin board systems allow users to express concerns, ask and answer questions, and receive information from others, usually about a topic of common interest. Individuals with a **modem** and **communications software** generally can dial up a BBS directly, sometimes using a toll-free number; Internet connections are not typically necessary.

Cyberspace—a term used to explain the theoretical boundaries of the Internet and other online services; coined by William Gibson in his 1984 science fiction novel, *Neuromancer*.

Free-nets—grassroots efforts to provide networking services to communities through libraries or free or low-cost dial-up connections. (Free-nets may also be accessed via the Internet.)

Hypertext—a way of organizing and linking information that allows users to access related text, images, or sounds from a single computer screen. For example, a user reading an encyclopedia entry on jazz on any hypertext-capable system could also hear excerpts from recordings, look up biographical facts about musicians, and see photos of them. Hypertext is the basis of the World Wide Web.

Information Superhighway—often used as a synonym for the **Internet**, this theoretical concept is actually much broader, encompassing cable, video, and other communication

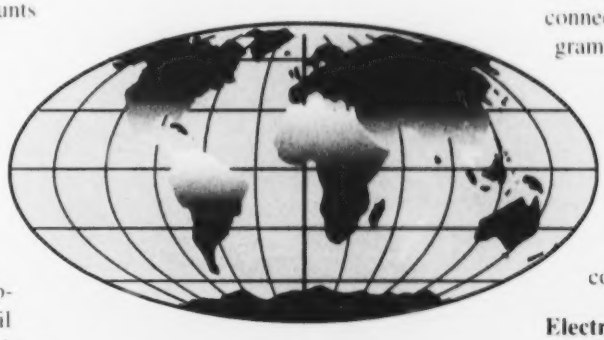
channels expected to be linked together in the future and easily accessible from homes, schools, and workplaces.

Internet—a worldwide collection of computer networks that serves as a conduit for the transfer of messages and files. It is operated most commonly from education and research institutions; individuals have accounts on **nodes**.

Listserv—a network-based discussion group devoted to a particular topic, such as educational administration, special education, or community colleges. To sign on to a listserv, you send your **e-mail address** to the listserv moderator or to an automated program that distributes mail messages. Once you are subscribed to the list, you will receive all e-mail messages that are posted, and you may post messages that will be read by other subscribers. (Be careful not to join too many listservs: some can generate more than 100 e-mail messages a day!) If you'd like to start your own listserv, check with your network provider for technical details.

National Information Infrastructure (NII)— a broad proposal for the federal government to establish standards and governing bodies for the transmission of digital data. Most provisions of the NII are still being debated. Secretary of Education Richard W. Riley refers to the NII as a "seamless web" of communication networks, computers, databases, telephones, televisions, radios, and satellites.

USENET—a system of thousands of special interest groups, called newsgroups, to which readers can send or "post" messages; these messages are then distributed to other computers on the network. USENET is accessible via the Internet, some locally run bulletin boards, and some commercial services. Your network provider can tell you whether you have access to USENET newsgroups and, if so, how to join. Most systems will allow you to search the names of **newsgroups** by keyword: search for "education" if you're interested in general education issues, or "k12" if your primary interest is grades K through 12. (Note: Some newsgroups are not moderated—no one filters the messages or is responsible for reminding members of **"netiquette"**—and discussions can become chaotic. Moreover, student access should be monitored because many topics are not suitable for minors.)



World Wide Web (also called the Web)—a **hypertext** system for finding and accessing Internet resources organized by colorful, graphics-oriented "home pages." The Web links objects seamlessly so users can go directly to particular items located anywhere in **cyberspace**. To access the Web, users need a modem, an Internet connection, and a special client program (see **Web browser**).

About Making a Connection

Download—to transfer information from a computer network to a personal computer.

Electronic conferencing—adding comments about a topic to an ongoing discussion. The discussion could take place over a **listserv**, on a **bulletin board**, or in a **USENET newsgroup**.

E-mail—electronic mail in which messages are sent through a network. To send e-mail, you need an e-mail address—a combination of letters, numbers, and symbols you select when you get an account on the **Internet** or subscribe to a commercial online service.

Emoticons (also called "smilies")—symbols, often composed of punctuation marks, that are added to **e-mail** to help convey emotion or personalize a message. Examples include a smiling face :-) or a frowning face with glasses 8-(. Tip your head to the left to see them.

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A Sampling of Interesting Web Sites for Teachers and Students

Web66: A K–12 World Wide Web Project
(University of Minnesota, College of Education)
http://web66.coled.umn.edu

HotList of K–12 Internet School Sites
(Gleason Sackman, North Dakota State University)
http://toons.cc.ndsu.nodak.edu/~sackmann/k12.html

Center for Networked Information Discovery & Retrieval Education WWW Servers
http://k12.cnidr.org

North Central Regional Educational Laboratory's Pathways to School Improvement
http://www.ncrel.org/ncrel/sdrs/pathways.htm

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FTP—File Transfer Protocol; a set of procedures that allow a computer to locate files on another computer on the **Internet** and copy them for local use.

Hypertext Transfer Protocol (HTTP)— a standard used by **World Wide Web** servers to provide rules for moving text, images, and sound across the Internet.

Snail-mail (s-mail)—messages sent via the postal system rather than **e-mail**.

Surfing the 'Net—the act of looking for information on the **Internet**.

Telnet—an **Internet** protocol for connecting to a remote computer. With Telnet, your computer can function as if it is linked directly to the other computer.

Upload—to transfer information from a personal computer to a computer network.

URL—Uniform Resource Locator; an address system for naming **World Wide Web** locations and materials.

What Is . . .

The following items are search engines—different ways to find information in cyberspace.

Archie—a search engine used for locating **FTP** files on the **Internet**. Although this search engine has its uses, it has largely been replaced by more user-friendly engines.

Gopher—an information retrieval program developed at the University of Minnesota (home of the Golden Gophers) in the early 1990s. Gopher encompasses **FTP** and **Telnet** and gives users a simple menu interface through which to access Internet resources. Gopher users are presented with a list of files and services they can retrieve without necessarily knowing their physical location.

Veronica—a service developed at the University of Nevada to help users access **Gopher** directories and the files they contain. Veronica maintains an index of titles of Gopher items; users search by keywords and Boolean operators (AND, OR, NOT) to obtain a set of Gopher items on the topic they're interested in. They can access any of the resulting data from the returned menu.

WAIS (Wide-Area Information Server)—a search engine used for looking up information on many different computer systems from a single interface on the **Internet**.

Web browser—a client program that enables users to navigate the graphics-oriented portion of the **Internet** known as the **World Wide Web**. Web browsers such as **Lynx**, **Mosaic**, and **Netscape** allow users to take advantage of **hypertext** links to move from item to item on the Web. Web browsers enable users to access images, text, audio, animation, and specialized scientific data files. (A word of caution: Not everyone on the Internet can access the World Wide Web through Web browsers because their image capabilities require high **bandwidth** and a fairly sophisticated computer.)

– Compiled by Barak Stussman
ACCESS ERIC

An excellent example of a Gopher/Web site for educators is the AskERIC Virtual Library. To get there, gopher to ericir.syr.edu or set your Web browser to http://ericir.syr.edu. If you want to connect to the U.S. Department of Education's Gopher server, the remote address is gopher.ed.gov. If you have a Web browser, open the URL and connect to http://www.ed.gov.

For a list of public Internet access points to the ERIC database and step-by-step login instructions, send an e-mail message to ericdb@aspensys.com.

Federal Initiatives in Educational Technology

Educational technology is a key element of many education improvement efforts. It enhances teaching and learning and is vitally important for preparing young people for the workplaces of tomorrow. The National Information Infrastructure (NII), set forth by the President, encourages an acceleration of the goal to connect all of the nation's classrooms, libraries, hospitals, and law enforcement agencies to the information superhighway.

The U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA), which advises the President on domestic and international telecommunications policies, maintains a toll-free phone number citizens may call for information about the information superhighway. Call 1–800–NII–8818, gopher to **gopher.ntia.doc.gov**, or open the URL and connect to **http://www.ntia.doc.gov**.

The federal government has undertaken several initiatives to help K–12 schools develop, apply, and use technology to enhance student learning and achievement and educational practice. A list of selected federally sponsored online sites and grant programs follows. Here and elsewhere in this journal, if an Internet address appears to have changed, please contact the host organization directly.

Online Sites

INet. The U.S. Department of Education maintains a Gopher/FTP/World Wide Web site that includes general information about the Department and its programs, as well as directories of effective programs and education-related organizations; research findings and syntheses; publications for teachers, parents, and researchers; and funding opportunities. INet also offers links to ERIC and other Department of Education-sponsored Gophers and World Wide Web sites, including those maintained by the Regional Educational Laboratories and the National Research Centers. Among the many full-text resources available on the INet Online Library are:

- Information on elementary and secondary programs, school-to-work-transition, family involvement, and education technology;
- Education research findings and statistics;
- *A Teacher's Guide to the U.S. Department of Education* and *A Researcher's Guide to the U.S. Department of Education*;
- A searchable database of Blue Ribbon Schools; and
- The National Commission on Time and Learning's *Prisoners of Time*.

Gopher to **gopher.ed.gov** (or select North America —> USA —> General —> U.S. Department of Education from the All/Other Gophers menu on your system). If you have a Web browser, open the URL and connect to **http://www.ed.gov**.

Eisenhower National Clearinghouse for Mathematics and Science Education (ENC). ENC offers educators a searchable database of K–12 math and science instructional resources, as well as a database of federal programs, searchable by state. The full-text of various publications and links to other materials of interest to math and science educators are also provided. To reach ENC via modem, dial 1–800–362–4448 or 1–614–292–9040. If you have Internet access, telnet or gopher to **enc.org**. If you have a Web browser, set the URL to **http://www.enc.org**.

FedWorld®. FedWorld Online Information Service, established by the National Technical Information Service (NTIS), provides the public with a user-friendly central resource for government information, particularly in the scientific, business, and technical areas. Through FedWorld, individuals also may obtain public access to more than 100 federal online systems for up to 3 hours per day at no charge. To access FedWorld with a modem, dial 1–703–321–8020. If you have Internet access, telnet to **fedworld.gov** or FTP to **ftp.fedworld.gov** (log-on "anonymous"). If you have a Web browser, set the URL to **http://www.fedworld.gov**.

Library of Congress. Educators may tap into the vast holdings of the Library of Congress via Gopher

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(marvel.loc.gov, Port 70) or Web browser **(http://www.loc.gov)**. To access extensive legislative information such as pending bills and House and Senate data, set your URL to **http://thomas.loc.gov.**

NASA Spacelink. The National Aeronautics and Space Administration (NASA) Spacelink is an electronic information system containing current NASA educational services, classroom materials, instructional activities, and space program spinoffs, as well as NASA news, information and reference data on aeronautics and space exploration, and NASA Field Center activities. For a direct connection, have your modem dial 205–895–0028. If you have Internet capabilities, gopher to **spacelink.msfc.nasa.gov**, or point your WWW browser to **http://spacelink.msfc.nasa.gov**.

Technology Resources Center. The Technology Resources Center at the National Library of Education is a demonstration site for the application of technology at all levels of education. The center offers personalized demonstrations to educators and visitors of such cutting-edge technology as satellite downlinks, interactive videodiscs, CD-ROM, and the latest computer hardware and software. Appointments are encouraged, but educators and the general public are welcome to walk in to the Center's office at Capitol Place, 80 F Street NW, Washington DC. Call 202–219–1699 or write to 555 New Jersey Avenue NW, Washington, DC 20208–5725.

Grant Programs

Note: Grant information was current at the time of writing. Some programs may be changed in the coming months.

U.S. Department of Education

Technology funding has been made available to the states through the Goals 2000: Educate America Act. Grants for additional state and local programs for school technology include the following:

Challenge Grants for Technology in Education. The Interagency Technology Task Force in the Department of Education recently closed a competition for grants to support communities of educators, parents, industry partners, and others who are working to transform their factory-era schools into Information-Age learning centers. Each application included a local education agency acting within a strong consortium of partners to address community needs, including state education agencies, colleges and universities, telecommunications firms, entertainment producers, software developers and hardware manufacturers, libraries and museums, community centers, and local businesses.

Funds awarded through the grants will supplement the partners' investments by supporting new curriculum, professional development, and evaluations of educational effectiveness. Approximately 12 grants will average $1 million per year; four or five grants may range between $2 and $3 million per year. Challenge grants are expected to be funded annually for 5 years. For more information, contact the Interagency Technology Task Force, U.S. Department of Education, 600 Independence Avenue SW, Washington, DC 20202–5544; 202–708–6001.

Regional Technology Consortia Program. In late 1995, the Department of Education will award approximately $10 million to consortia in six geographic regions to help state and local education agencies, teachers, administrators, and others integrate advanced technology into K–12 classrooms and media centers. The program will also support professional development and resource dissemination within each region. The Regional Technology Consortia will be composed of state education agencies, institutions of higher education, and nonprofits, which will work closely with established education networks such as the National Diffusion Network. For more information, contact the Office of Educational Technology, U.S. Department of Education, Office of Educational Research and Improvement, 555 New Jersey Avenue NW, Washington, DC 20208; 202–401–1444.

Star Schools Program. This multimillion dollar distance education program is designed to improve instruction in various subjects through technology use, particularly in schools serving low-income (Chapter 1) students and other traditionally underserved populations. Demonstration grants are provided to develop audiovisual facilities and equipment, to create instructional programming, and to provide technical assistance for improving instruction through technology. More than 50,000 teachers, administrators, parents, and policy makers have participated in staff development and community development activities produced via satellite, compressed video technology, fiber optics, videodisc, and microcomputer-based networks. For further information, contact Star Schools, U.S. Department of Education, Office of Educational Research and Improvement, 555 New Jersey Avenue NW, Washington, DC 20208; 202–219–2116.

Teacher Networking Project. Fifteen grants totaling $1.8 million were recently awarded to projects in 10 states—California, Colorado, Florida, Louisiana, Michigan, Missouri, Mississippi, New York, Oregon, and Texas—to support teacher networking through mentoring, online training, and curriculum development. For more information, contact the Office of Elementary and Secondary Education, U.S. Department of Education, 600 Independence Avenue SW, Portals Building, Room 4000, Washington, DC 20202–6100; 202–219–2143.

The Technology, Educational Media, and Materials Program (TMM). TMM, administered by the Department of Education's Office of Special Education Programs, Division of Innovation and Development, seeks to improve the educational outcomes of children with disabilities by providing discretionary grants to support research on how technology can be used to assess and instruct these children. The

TMM Program also supports efforts to develop new TMM tools, train practitioners, and develop projects that advance the availability, quality, use, and effectiveness of technology. TMM also supports educational media and materials in the education of children and youth with disabilities. For further information, contact the TMM Program, Office of Special Education Programs, 330 C Street SW, Room 3523, Washington, DC 20202; 202–205–8123.

National Science Foundation (NSF)

The Applications of Advanced Technology Program. This program provides grants to examine the strengths and weaknesses of innovative applications of advanced technologies and to lay the foundation for using revolutionary computer and telecommunications systems and related technologies for teaching and learning science and mathematics.

The Networking Infrastructure for Education Program (NIEP). NIEP funds alliances of academic institutions, school districts, professional societies, state agencies, and others concerned with education reform to undertake policy studies, research, and demonstration projects related to the role of electronic networks in support of reformed education.

The Teacher Enhancement Program (TE). TE seeks to improve, broaden, and deepen the interdisciplinary and pedagogical knowledge of teachers, administrators, and others who play significant roles in providing high-quality mathematics, science, and technology education for students from pre-kindergarten through 12th grade.

For information on any of the above programs, contact NSF, 4201 Wilson Boulevard, Arlington, VA 22230; 703–306–1651.

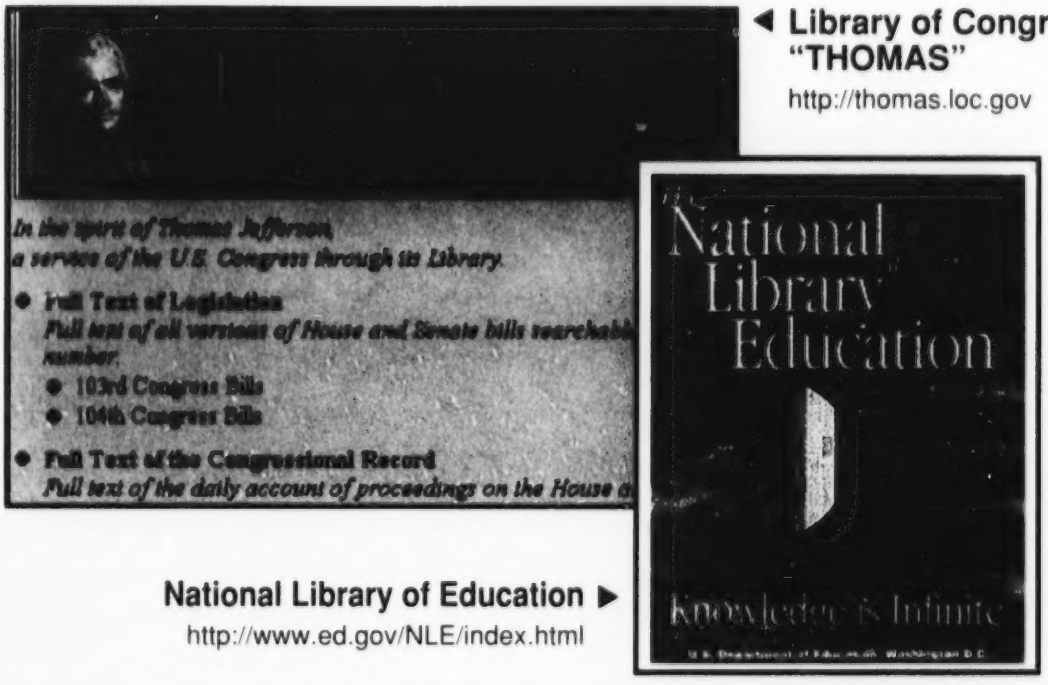
U.S. Department of Commerce

The Public Telecommunications Facilities Program (PTFP). PTFP provides financial assistance for noncommercial telecommunications equipment. Call 202–482–5802 or write to the Senior Program Director, National Telecommunications and Information Administration, U.S Department of Commerce, Washington, DC 20230.

The Telecommunications and Information Infrastructure Application Program (TIIAP). TIIAP awards grants to state and local governments and nonprofit organizations for the planning and construction of telecommunications networks that will offer innovative educational, cultural, and social services. Send e-mail to **tiiap@ntia.doc.gov** or contact National Telecommunications and Information Administration, U.S Department of Commerce, Room H–4889, Washington, DC 20230; 202–482–2048.

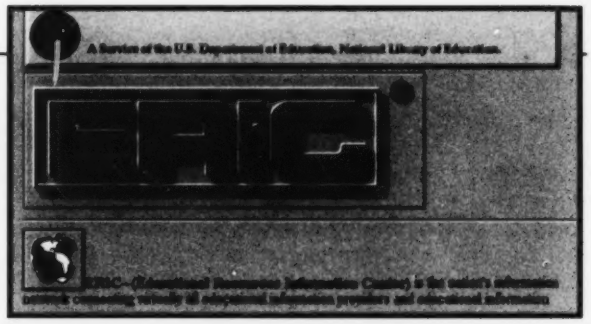
– Compiled by Barbara Reuben-Powell and Carol Boston, ACCESS ERIC

Classroom Resources on the World Wide Web


In the spirit of Thomas Jefferson,
a service of the U.S. Congress through its Library
Full Text of Legislation
103rd Congress Bills
104th Congress Bills
Full Text of the Congressional Record
National Library Education
Knowledge is Infinite

◀ **Library of Congress "THOMAS"**
http://thomas.loc.gov

National Library of Education ▶
http://www.ed.gov/NLE/index.html



Online With ERIC

One of the great things about cyberspace is that the people who run the various sites create links with other sites, allowing you to go beyond the Gopher site or World Wide Web (WWW) page you start with. We hope you'll visit the following ERIC sites both for their own offerings and for the gateways they provide to other education resources.

AskERIC

The ERIC Clearinghouse on Information & Technology at Syracuse University manages AskERIC, an Internet-based service that provides a full range of education information to teacher educators, teachers, students, librarians, counselors, administrators, parents, and others. AskERIC offers:

- A question-answering service,
- The AskERIC Virtual Library, and
- Internet access to the ERIC database.

If you have an education-related question, send it via e-mail to **askeric@ericir.syr.edu**. You'll receive an e-mail response in approximately 48 hours. Depending on the nature of your question, you might receive the full text of one or more research summaries called ERIC Digests, the results of a short ERIC database search, or the addresses of relevant Internet Gopher sites and listservs.

Through the AskERIC Virtual Library, you can find InfoGuides and database searches on key education topics; the full text of lesson plans, research summaries, and other resources; and gateways to other education-related Internet sites. To use the AskERIC Virtual Library, gopher or telnet to **ericir.syr.edu**. If you have Lynx, Mosaic, or another WWW browser, open the URL and connect to **http://ericir.syr.edu**.

AskERIC also provides public access to the ERIC database with search capability. The URL is **http://ericir.syr.edu/ERIC/eric.html**. You can also telnet to **ericir.syr.edu**. Log in as "Gopher," hit Return/Enter for the password, then follow the instructions.

National Parent Information Network

The ERIC Clearinghouse on Elementary and Early Childhood Education (ERIC/EECE) at the University of Illinois at Urbana–Champaign has created a WWW server on the Internet specifically devoted to child development, care, and education, and the parenting of children from birth through early adolescence. This National Parent Information Network (NPIN), cosponsored by the ERIC Clearinghouse on Urban Education at Columbia University, includes:

- Short articles from groups such as the National Urban League, the National PTA, and the Center for Early Adolescence;
- Discussion groups and forums on early childhood topics; and
- Parents AskERIC, a question-answering service for parents that taps the resources of the federally funded ERIC system.

To access NPIN, gopher to **ericps.ed.uiuc.edu**. If you have WWW access, open the URL and connect to **http://ericps.ed.uiuc.edu/npin/npinhome.html**. If you have e-mail capabilities, you can send your questions about early childhood and elementary topics to Parents AskERIC at **askeece@uiuc.edu**.

Other ERIC Gopher/WWW Sites

All ERIC components have e-mail addresses (listed on the inside back cover) for routine correspondence. The following components also offer online services.

ACCESS ERIC (for general information about the ERIC system and links to all other ERIC sites)
Gopher: aspensys.aspensys.com, Education and Training Division
URL: http://www.aspensys.com/eric2/welcome.html

Adjunct ERIC Clearinghouse for Art Education
URL: http://www.indiana.edu/~ssdc/art.html

Adjunct ERIC Clearinghouse for Child Care
URL: http://ericps.ed.uiuc.edu/nccic/nccichome.html

Adjunct ERIC Clearinghouse on Consumer Education
URL: http://www.emich.edu/public/coe/nice/nice.html

Adjunct ERIC Clearinghouse for Law-Related Education
URL: http://www.indiana.edu/~ssdc/lre.html

Adjunct ERIC Clearinghouse for United States-Japan Studies
URL: http://www.indiana.edu/~japan

ERIC Clearinghouse on Assessment and Evaluation
Gopher: gopher.cua.edu, Special Resources
URL: http://www.cua.edu/www/eric_ae

ERIC Clearinghouse on Counseling and Student Services
URL: http://www.uncg.edu/~ericcas2

ERIC Clearinghouse on Educational Management
URL: http://darkwing.uoregon.edu/~ericcem/home.html

ERIC Clearinghouse on Elementary and Early Childhood Education
Parents AskERIC (Internet-based question-answering service): askeece@uiuc.edu
National Parent Information Network (NPIN) Gopher: ericps.ed.uiuc.edu
NPIN URL: http://ericps.ed.uiuc.edu/npin/npinhome.html

ERIC Clearinghouse on Information & Technology
AskERIC (Internet-based question-answering service): askeric@ericir.syr.edu
AskERIC Virtual Library Gopher: ericir.syr.edu
AskERIC Virtual Library URL: http://ericir.syr.edu

ERIC Clearinghouse on Languages and Linguistics
URL: http://ericir.syr.edu/ericcll

ERIC Clearinghouse on Reading, English, and Communication
Gopher: gopher.indiana.edu
URL: http://www.indiana.edu/~eric_rec

ERIC Clearinghouse on Rural Education and Small Schools
Bulletin Board: 1–800–377–7641 (at "first name" prompt, type ERIC; at "last name," CRESS; at "password," GUESS.
URL: http://www.ael.org/~eric/eric.html

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
Gopher: gopher.ericse.ohio-state.edu
URL: http://www.ericse.ohio-state.edu

ERIC Clearinghouse for Social Studies/Social Science Education
URL: http://www.indiana.edu/~ssdc/eric-chess.html

ERIC Clearinghouse on Urban Education
URL: http://eric-web.tc.columbia.edu

Oryx Press (publisher of *Current Index to Journals in Education*)
Gopher: gopher.oryxpress.com
URL: http://www.oryxpress.com

Sample ERIC World Wide Web Home Pages

Selected Resource Organizations

Given the tremendous growth in K–12 computer networking, we offer a selective rather than a comprehensive list of organizations you may contact for more information. If you're not sure if your state has an education network, contact your state department of education. If an e-mail, Gopher, or World Wide Web address provided below appears to have changed, please contact the host organization directly.

Academy One
National Public Telecomputing Network (NPTN)
8802 San Antonio
Buena Park, CA 90620
Phone: 714–821–4472
E-mail: a-1@nptn.org
URL: http://yn.la.ca.us

NPTN is a nonprofit organization dedicated to developing free public access to computerized information and communication services for the general public. NPTN's educational programs, called Academy One, currently include a daily electronic newsletter for administrators, curriculum databases for teachers, and e-mail clubs for students. Special events have included a simulated space launch, TeleOlympics, a bridge-building contest, and a sonnet-writing competition. To receive Academy One program updates by e-mail, send a request to **a-1@nptn.org**.

American Federation of Teachers (AFT)
555 New Jersey Avenue
Washington, DC 20001
Phone: 202–879–4400

AFT offers a bulletin board and conference area on America Online in the Teachers' Information Network within the Education section. Some materials are available to the public; others are restricted to members.

Association for Educational Communications and Technology (AECT)
1025 Vermont Avenue NW, Suite 820
Washington, DC 20005
Phone: 202–347–7834
Fax: 202–347–7839
Gopher: gopher.sunbird.usd.edu 72
URL: http://www.aect.org/

AECT serves educational media and instructional technology professionals working toward systemic improvement of instruction and learning through effective use of technology. It publishes *Tech Trends*, a magazine about integrating technology and education, and *Educational Technology Research and Development*, a scholarly research journal.

Association for Supervision and Curriculum Development (ASCD)
Education and Technology Resources Center
1250 North Pitt Street
Alexandria, VA 22314–1453
Phone: 703–549–9110
E-mail: etrc@ascd.org
Gopher: gopher.ascd.org
URL: http://www.ascd.org/

This center offers ASCD members and others technical assistance and publications, including the *Curriculum/Technology Quarterly* newsletter.

Computer Learning Foundation
Box 60007
Palo Alto, CA 94306
Phone: 415–327–3347

This nonprofit educational foundation is dedicated to advancing computer literacy. Write to request a free copy of *Computer Learning*, a booklet that describes the group's projects and publications supporting technology in education. Offerings include lesson plan books that aid in curriculum integration.

Consortium for School Networking (CoSN)
P.O. Box 65193
1555 Connecticut Avenue NW
Suite 200
Washington, DC 20036
Phone: 202–466–6296
Fax: 202–462–9043
E-mail: info@cosn.org
Gopher: gopher.cosn.org
URL: http://cosn.org

CoSN is a membership organization of institutions formed to further the development and use of computer network technology in K–12 education. To join CoSN, request an application from the above address. To contribute your ideas, lesson plans, and projects for others to access over the Internet, send as e-mail to **info@cosn.org**.

Education Development Center Center for Children and Technology (CCT)
96 Morton Street, 7th Floor
New York, NY 10014
Phone: 212–807–4200
E-mail: cct@edc.org

This research center investigates the key roles that technology can play in

supporting and sustaining qualitative change in the nation's schools. It carries out research and development projects on how technology can provide decentralized and multiple access to a variety of media; supports teachers and students in creating a broad range of materials and products; and helps to bring about significant changes in teaching and learning. Write or send e-mail for a free subscription to the quarterly newsletter and a listing of low-cost publications.

Electronic Frontier Foundation (EFF)
1667 K Street NW, Suite 801
Washington, DC 20006–1605
Phone: 202–861–7700
E-mail: ask@eff.org
Gopher: gopher.eff.org
URL: http://www.eff.org

This membership organization focuses on policy issues related to national networking. In the K–12 context, EFF concerns itself with policies for determining what resources students will have access to. EFF publishes a free newsletter, *EFFector Online*, on general Internet topics.

ERIC Clearinghouse on Information & Technology (ERIC/IT)
Syracuse University
4–194 Center for Science and Technology
Syracuse, NY 13244–4100
Phone: 1–800–464–9107
E-mail: eric@ericir.syr.edu
AskERIC (Internet-based question-answering service): askeric@ericir.syr.edu
Gopher: ericir.syr.edu
URL: http://ericir.syr.edu

ERIC/IT is one of 16 clearinghouses in the ERIC system, which is sponsored by the U.S. Department of Education, Office of Educational Research and Improvement, within the National Library of Education. ERIC/IT specializes in educational technology and library/information science and processes documents in these areas for the ERIC database. The clearinghouse also provides user services and publications related to its scope areas, including help sheets for using the Internet.

ERIC/IT piloted and operates AskERIC, the popular Internet-based question-answering service for teachers, administrators, librarians, parents, and others. It also maintains the AskERIC Virtual Library of full-text lesson plans and other practitioner-oriented materials; provides public access to the ERIC database; and administers several listservs, including LM_NET for library media specialists.

The Global SchoolNet (FrEdMail)
P.O. Box 243
Bonita, CA 91908
Phone: 619–475–4852
E-mail: info@gsn.org
URL: http://www.gsn.org

The FrEdMail (Free Educational Mail) Network, founded in 1984, is now being called The Global SchoolNet because it links students and educators around the world. Teachers share experiences, curriculum ideas, and teaching materials, as well as information about workshops.

I*EARN
345 Kear Street
Yorktown Heights, NY 10598
Phone: 914–962–5864
Fax: 914–962–6472
E-mail: iearn@iearn.org
URL: http://www.igc.apc.org/iearn/

The International Education and Resource Network (I*EARN) links more than 1,000 primary and secondary schools and youth-service organizations in 20 countries. Through I*EARN's online conferences, students and teachers work collaboratively on ecological and humanitarian relief projects such as rainforest preservation and support for children in Bosnia and Somalia.

(continued on page 22)

Funding Resources

Many educators are interested in locating information about grants to help fund technology projects. Here are a few resources to get you started:

- **The Foundation Center**. This independent nonprofit organization was established by foundations in 1956 to provide an authoritative source of information on foundation and corporate giving. The Center maintains a comprehensive database of grant programs and publishes *The Foundation Directory*, the classic reference work for grantseekers. Information is provided at no charge at five Foundation Center libraries (New York, San Francisco, Cleveland, Atlanta, and Washington, DC) and 200 cooperating libraries across the country. To locate the collection nearest you, call 1–800–424–9836 or visit the Foundation Center's Web site at **http://fdncenter.org/**.

- **The Grantwriter's Newsletter of Funding Resources.** This monthly newsletter, written and published by an educator, offers timely information on grants and contests. $36 for 12 issues. *Grantwriter's Newsletter of Funding Resources*, 617 Wright Avenue, Terrytown, LA 70056.

- **GrantsWeb**. This Internet site (**http://infoserv.rttonet.psu.edu/gweb.htm**) is a starting point for accessing grants-related information and resources online, including funding opportunities, grants databases, and policy developments. GrantsWeb is in an early stage of development; your contributions of information for posting and your assistance in identifying other relevant resources are encouraged.

Selected Resource Organizations

International Society for Technology in Education (ISTE)
1787 Agate Street
Eugene, OR 97403–1923
Phone: 1–800–336–5191 or
503–346–4414
AOL and AppleLink: ISTE
CompuServe: 70014,2117
Internet: ISTE@oregon.uoregon.edu
Gopher: gopher.uoregon.edu
URL: http://iste-gopher.uoregon.edu

ISTE is the largest international nonprofit professional organization serving computer-using educators. It is dedicated to improving education through the use and integration of technology. Members receive a subscription to *Learning and Leading with Technology* (formerly, *The Computing Teacher*) and may participate in a special interest group on telecommunications.

International Technology Education Association (ITEA)
1914 Association Drive
Reston, VA 22091–11539
Phone: 703–860–2100
URL: http://www.tmn.com/
Organizations//ris/TTRA.html

This membership organization focuses on ensuring that all children receive the best possible education about technology and supports continuing improvement in technology programs and professional development. ITEA is spearheading a standards project called *Technology for All Americans*, which will develop a rationale and structure for technology education and standards for K–12 curriculum content, evaluation/assessment, and teacher education.

The Internet Society
12020 Sunrise Valley Drive, Suite 210
Reston, VA 22091
Phone: 703–648–9888
Fax: 703–648–9887
E-mail: isoc@isoc.org
URL: http://www.isoc.org/

The Internet Society is an international membership organization for individuals and organizations that promotes the use of the Internet. Its goals are: (1) To facilitate and support the technical evolution of the Internet as a research and education infrastructure and to stimulate the involvement of the scientific community, industry, government, and others in the evolution of the Internet; (2) To educate the scientific community, industry, and the public at large concerning the technology, use, and application of the Internet; (3) To promote educational applications of Internet technology for the benefit of government, colleges and universities, industry, and the public at large; and (4) To provide a forum for exploration of new Internet applications and to stimulate collaboration among organizations in their operational use of the global Internet.

K12Net
c/o Janet Murray
1151 Southwest Vermont Street
Portland, OR 97219
Phone: 503–280–5280, ext. 450
E-mail: jmurray@psg.com
URL: http://arlo.wilsonhs.
pps.K12.or.us

This bulletin board-based system works through "echo" forums built around curriculum areas for teachers and students interested in particular topics. Cooperative projects such as the creation of the *Global Village News* publication are undertaken through forums. Access is through FidoNet, a free, general-interest computer network that joins more than 15,000 computer bulletin boards in more than 50 countries. Call a local computer store or your public library to find out about active bulletin boards in your region.

KIDSPHERE
c/o Robert D. Carlitz
University of Pittsburgh
Pittsburgh, PA 15260

KIDSPHERE is a global Internet-based electronic discussion group for teachers and administrators who want to develop collaborative projects, ranging from pen-pal exchanges to international collaborations involving thousands of teachers. It includes archives of materials from previous projects. A spinoff of the KIDSPHERE listserv is another listserv called KIDS, which allows children to post messages to other children. For more information, send an e-mail request to **kidsphere-request@vms.cis.pitt.edu** or **joinkids@vms.cis.pitt.edu**.

National Center for Technology Planning (NCTP)
c/o Larry S. Anderson
P.O. Box 5425
Mississippi State, MS 39762
Phone: 601–325–2281
Fax: 601–325–7599
E-mail: lsa1@ra.msstate.edu
Gopher: gopher.msstate.edu
URL: http://www2.msstate.edu/~lsa1

NCTP electronically collects and disseminates school district technology plans, planning aids such as checklists and forms and relevant monographs.

National Education Association (NEA) School Renewal Network
NEA National Center for Innovation
1201 16th Street NW
Washington, DC 20036
Phone: 202–822–7783
Fax: 202–822–7482
E-mail: ljennings@cet.nea.org

Dedicated to school reform, this electronic network was created to develop a research base through a community of actively engaged practitioners and researchers. Participants include partners in the Center's programs, federally funded research and development laboratories and centers, several research universities, and schools involved in other national school reform efforts. NEA also offers resources to members and the general public through America Online.

National Geographic Kids Network
National Geographic Society
Educational Services
Department 5413

Selected Resource Organizations

Washington, DC 20036
Phone: 1–800–368–2728

Kids Network provides a hands-on geography and science curriculum in English and Spanish for grades 4 through 6. Students are assigned to research teams composed of 10 to 15 different classes within and outside of the United States. They conduct original research and learn about scientific processes as they investigate such topics as acid rain, weather, and pollution at the local level, then compare data with other members of the research team. Scientists help them trace geographic patterns in the data through letters, maps, and graphs.

National School Boards Association Institute for the Transfer of Technology to Education (ITTE)
1680 Duke Street
Alexandria, VA 22314
Phone: 703–838–6213

ITTE offers publications, conferences, and seminars for school board members, school board staff, and other educators on the effective use of technology in education. School districts pay membership fees according to their size.

National School Network Testbed
BBN Systems and Technologies
70 Fawcett Street
Cambridge, MA 02138
Phone: 617–873–4247
Fax: 617–873–2455
E-mail: bpeake@bbn.com
URL: http://copernicus.bbn.com/testbed2/TB2home.html

The National School Network Testbed, organized by the Educational Technologies group at BBN and funded by the National Science Foundation, consists of 250 institutions, including 150 U.S. schools that are using networks to support school change. During this phase of the Testbed, researchers are studying the costs and benefits of organizing the information infrastructure locally and involving everyone in the community in its creation. The Testbed Web site directs users to projects of Testbed partners around the country and provides resources and discussions on building the local information infrastructure and network-based curriculum and instruction, professional development, and evaluation.

PBS Learning Link
1320 Braddock Place
Alexandria, VA 22314
Phone: 703–739–8464
URL: http://www.whro-pbs.org/ll/

Sponsored by the Public Broadcasting Service, PBS Learning Link provides access to Curriculum Connection, a searchable database of public television programs, lesson plans, and classroom projects, and lesson plans from the National Teacher Training Institute. It also provides links to other educational Internet connections and school, college, and university Web sites.

PSINet (People Sharing Information Network)
Council of State Science Supervisors
c/o Jack Gerlovich
Drake University
3206 University Avenue
School of Education
Des Moines, IA 50311
Phone: 515–271–3912

PSINet is a national computer conferencing network that links state science and mathematics supervisors with science and mathematics education agencies. Networks are in place in nearly 40 states.

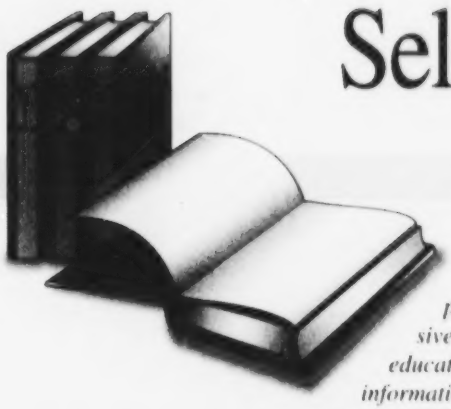
TERC
2067 Massachusetts Avenue
Cambridge, MA 02140
Phone: 617–547–0430
Fax: 617–349–3535
E-mail: communications@terc.edu
Gopher: gopher.hub.terc.edu
URL: http://hub.terc.edu:70/hub/owner/TERC

TERC is a nonprofit education research and development organization committed to improving mathematics and science learning and teaching. Its work includes creating innovative curriculum, fostering teacher development, conducting research on teaching and learning, and developing technology tools. For more than a decade, TERC has explored the educational potential of telecommunications. Its Network Science curriculum and projects include LabNet (an electronic community for teachers), Global Lab, and the Testbed for Telecollaboration.

– Compiled by Barak Stussman and Michael Heeg, ACCESS ERIC

If you need help finding the best way to use ERIC, call ACCESS ERIC at 1–800–LET–ERIC

Selected Reading List



Books, magazines, and articles about computer networking are proliferating. The reading list that follows is by no means comprehensive, but rather a selective resource that will give teachers and teacher educators a starting point in their exploration. Because readers differ in their information needs and current levels of knowledge, we recommend that you study the table of contents or the introduction of each publication to determine whether it will be helpful to you. Items for which ERIC document numbers (ED followed by six digits) are provided may be read on microfiche at more than 1,000 locations across the country or purchased as paper copy from the ERIC Document Reproduction Service at 1–800–443–ERIC (3742). As noted, some of the items may be obtained over the Internet for free. These are often among the most current and regularly updated resources available.

Connect Online!
Lynne Schrum and Gwen Solomon, 1995

This telecommunications simulation package introduces middle school students and teachers to the online world without hardware and phone costs. Students practice sending e-mail, exploring forums, uploading and downloading files, conducting online research in various curriculum areas, and exploring America Online, CompuServe, and the Internet. Software is available for LANs or stand-alone Windows and Macintosh platforms. A teacher's resource guide and a workbook are also available. $340.95. For product information, call 1–800–824–5179 or fax your request to 1–800–453–7882. Cincinnati, OH: Thomson Learning Tools.

Crossing the Internet Threshold: An Instructional Handbook
Roy Tennant, John Ober, and Anne G. Lipow, 1993; ED 366 335

This handbook is designed for people who have access to the Internet and want to learn how to use it and for people who want to teach Internet skills to others. It includes the content of a 14-hour training institute and beginning- and advanced-level exercises, as well as discussion topics, sample overheads and other materials, and a checklist of reminders for trainers. $45. Library Solutions Press, 1100 Industrial Road, Suite 9, San Carlos, CA 94070; 415–592–8904.

Demystifying the Internet
ERIC Clearinghouse on Adult, Career, and Vocational Education, 1994; ED 372 195

This issue of the *Practitioner File* offers help to adult, career, and vocational educators who have little or no experience with electronic networking. It explains how the Internet got started and how you can find a connection, and describes listservs and electronic journals of interest to this community. Free. Send an e-mail request to **ericacve@magnus.acs.ohio-state.edu** or write to ERIC/ACVE, 1900 Kenny Road, Columbus, OH 43210–1090.

Education on the Internet: A Hands-on Book of Ideas, Resources, Projects, and Advice
Jill Ellsworth, 1994

Chapters include Internet in Elementary, Middle, and High School Classrooms; Internet Resources by K–12 Curricular Area; How To Find More K–12 Information; Internet and Higher Education; Undergraduate Internet Resources by School [e.g., business, education]; Graduate Schools; Teaching and Learning with Computer-Mediated Communication; Scholarship, Research, Libraries, and Resources; Distance Learning; and Learning on Your Own. $25. Sam's Publishing, 201 West 103rd Street, Indianapolis, IN 46290–1097; 800–545–5914.

An Educator's Guide to Electronic Networking: Creating Virtual Communities
Barbara L. Kurshan, Marcia A. Harrington, and revised by Peter G. Milbury, 1994; ED 372 772

This guide (IR–96) will help planners and designers consider the type of networked community they want to create and how they can create it, drawing on existing networks and projects where possible. It offers a decision-making procedure and frameworks of models to guide network selection or creation. $10 plus $3 shipping. ERIC Clearinghouse on Information & Technology, Syracuse University, 4–194 Center for Science and Technology, Syracuse, NY 13244–4100; 1–800–464–9107.

EFF's Guide to the Internet, v. 2.38
(formerly *The Big Dummy's Guide to the Internet*)
Adam Gaffin, 1995

Written for novices who want to learn about the Internet, this user guide is available free of charge at several locations, including the Electronic Frontier Foundation's (EFF) online archives at **ftp.eff.org**, **gopher.eff.org** and **http://www.eff.org/**; through the EFF BBS (1–202–861–1223); and on America Online—keyword EFF. The *Guide* is also available in print form from MIT Press for $14.95 at many bookstores.

Evaluating Technology-Based Instructional Programs
Kathleen Holmes and Don Rawitsch, 1993

This booklet describes how to create evaluation plans that will help readers make decisions about technology. It covers both formative and summative evaluation of curriculum goals involving technology. $15. Published by the Texas Center for Educational Technology and available through the International Society for Technology in Education, 1787 Agate Street, Eugene, OR 97403–1923; 1–800–336–5191.

FYI on Questions and Answers: Answers to Commonly Asked "Primary and Secondary School Internet User" Questions
J. Sellers, 1994

This memo is directed to educators, school media specialists, and school administrators who recently connected to the Internet, who are accessing the Internet via dial-up or another means that is not a direct connection, or who are considering an Internet connection as a resource for their schools. Free. Anonymous FTP from **archie.internic.net** (**198.49.45.10**); change directory (cd) to *fyi* and type *get fyi22.txt*.

The Internet Handbook for School Users
Nancy Protheroe and Elizabeth Wilson, 1994; ED 375 821

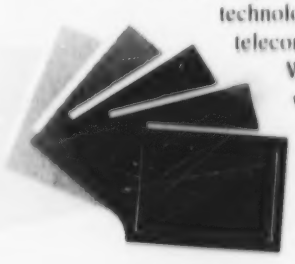
This 120-page handbook is suitable for readers considering school use of the Internet as well as novice and experienced users looking for Internet services and resources. It includes commonly asked questions and answers about educational implementation and use of the network; information about search tools; and a guide to K–12 Internet resources such as newsgroups, collaborative projects, and interesting sites. Educational Research Service (ERS) subscribers $12; others $24, plus $3.50 postage and handling. ERS, 2000 Clarendon Boulevard, Arlington, VA 22201; 703–243–2100.

K–12 Network Technology Planning Guide
California Department of Education, 1994

This guide is intended to help school administrators, teachers, and technology directors understand technical issues relating to network planning. It provides an indepth view of the major areas that must be considered and includes a staff training section, case studies, and resource lists. $11.95. K–12 Network Planning Unit, Education Technology Office, California Department of Education, P.O. Box 944272, 721 Capitol Mall, Sacramento, CA 94244–2720; 916–654–9662. Also available free via Gopher at **goldmine.cde.ca.gov**; go to California Department of Education; select Technology; then select the K–12 Network Technology Planning Guide.

Receptivity to Telecommunications Among K–12 Teachers in a Rural State
Aimee A. Howley and Craig B. Howley, 1994; ED 374 958

This survey examined the computer skills, available technology resources, and attitudes toward telecommunications of 262 K–12 teachers in West Virginia. In general, the teachers were highly receptive to technology use for themselves and their students, but lacked the necessary hardware and software to go online. The study



also outlined larger issues with the potential to affect rural teachers' use of technology such as the privatization of telecommunications. $7.70 plus postage. ERIC Document Reproduction Service, 7420 Fullerton Road, Suite 110, Springfield, VA 22153–2852; 1–800–443–ERIC.

The Switched-On Classroom: A Technology Planning Guide for Public Schools in Massachusetts
Massachusetts Software Council, 1994

This handbook offers a model for integrating technology into the classroom, documents successful examples of implementation, and provides a directory of resources to support the technology adoption process. $20. Massachusetts Software Council, One Exeter Plaza, Suite 200, Boston, MA 02116–2831.

Technology and Education Reform: The Reality Behind the Promise
Barbara Means, editor, 1994

This book illustrates how technology can support school reform, identifies promising technologies, and discusses how technology can help students and teachers accomplish their tasks. $29.95 plus 4.50 shipping and handling. Jossey-Bass, Inc., 350 Sansome Street, San Francisco, CA 94104–9825; 415–433–1767.

Technology and the Organization of Schooling
Jan Hawkins, 1993; ED 359 933

This technical report (No. 28) describes how technology can be designed and used to improve the educational system over the long term. Strategies include actively engaging students with multiple resources and people and providing environments in which students are personally well known. $3. Education Development Center, Inc., Center for Children and Technology, 96 Morton Street, 7th Floor, New York, NY 10014.

Technology Making a Difference: The Peakview Elementary School Study
Brent G. Wilson, Roger Hamilton, James L. Teslow, and Thomas A. Cyr, 1994

This case study (IR–98) focuses on the effects of implementing new technology at the elementary school level. The results include increases in student motivation and achievement. The authors document candid comments from teachers and students about the transition from traditional teaching methods to integrating new technology in the classroom. $15 plus $3 for shipping. ERIC Clearinghouse on Information & Technology, Syracuse University, 4–194 Center for Science and Technology, Syracuse, NY 13244–4100; 1–800–464–9107.

Telecommunications and Education: Surfing and the Art of Change
Gloria Frazier and Deneen Frazier, 1994; ED 377 834

This guide for using the Internet and other computer networks is designed to further education reform. It was written to help school board members, administrators, teachers, and other education leaders understand networks, assess their benefits, select appropriate vendors, and go online. $35 plus $5 shipping and handling. National School Boards Association Distribution Center, P.O. Box 161, Annapolis Junction, MD 20701–0161; 1–800–706–6722.

Telecommunications and K–12 Education: Findings from a National Survey
Margaret Honey and Andrés Henríquez, 1993; ED 359 923

This booklet reports on a survey conducted to obtain a systematic profile of activities currently being undertaken by kindergarten through grade 12 educators in telecommunications technology. Based on the responses of 550 educators from 48 states, selected because of their involvement with computer technology, this survey represents the first large-scale description of educators' telecommunications practices. Free. Request a copy via e-mail to **cct@edc.org** or write to Education Development Center, Inc., Center for Children and Technology, 96 Morton Street, 7th Floor, New York, NY 10014.

Telecommunications in the Classroom
Sara Armstrong, 1994; 2nd Edition

This book is an introduction, guidebook, and source of lesson plans for using telecommunications in the classroom. It describes various services and the Internet, provides details about becoming connected, and covers ethics and equity issues. $10. International Society for Technology in Education, 1787 Agate Street, Eugene, OR 97403–1923; 1–800– 336–5191.

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Using Technology To Support Education Reform
U.S. Department of Education, 1993; ED 364 220

This report (No. 065–000–00604–9) outlines ways in which technology can be used to support education reform. $7. New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250–7954; 202–512–1800.

Way of the Ferret: Finding Educational Resources on the Internet
Judi Harris, 1994

This handbook is designed to help educators acquire the knowledge, skills, and experience necessary to locate and use resources found on the Internet. It assumes readers have access to the Internet and some experience with a modem, communication software, and word processing. It provides an extensive listing of Internet-based education sites. International Society for Technology in Education. $24.95 (members $22.45). 1787 Agate Street, Eugene, OR 97403–1923; 1–800–336–5191.

The Whole Internet User's Guide and Catalog
Ed Krol, 1994; 2nd Edition

This user's guide to the Internet covers basics such as electronic mail and newsgroups as well as more elaborate research tools such as Gopher, WAIS, and the World Wide Web. The book includes extensive examples for Unix-based machines. $24.95. Published by O'Reilly & Associates and available at bookstores or through the International Society for Technology in Education, 1787 Agate Street, Eugene, OR 97403–1923; 1–800–336–5191.

Zen and the Art of the Internet: A Beginner's Guide
Brendan P. Kehoe, 1994

This book covers Internet addresses, e-mail, FTP, USENET newsgroups, Telnet, and other software tools, as well as print and online resources for Internet users. $23.95. Published by Prentice Hall and available at bookstores or through the International Society for Technology in Education, 1787 Agate Street, Eugene, OR 97403–1923; 1–800–336–5191.

– Compiled by Carol Boston and Barak Stussman, ACCESS ERIC.

Electronic Journals

Many organizations that maintain Gopher and Web sites post articles from print journals. Other organizations post entire issues. Two online journals of interest are the following:

■ ***Electronic School on the Web***. This electronic publication from the National School Boards Association is for K–12 school leaders and educators working to enhance student learning through the "judicious and appropriate use of technology." It covers networking trends and developments, case studies, and controversies relevant to education and technology in elementary and secondary schools throughout North America. Point your Web browser to: **http://www.access.digex.net/~nsbamags/e-school.html**. (A print version of *The Electronic School* is included as a supplement to *The American School Board Journal* and *The Executive Educator*.)

■ ***Classroom Connect***. This publication is targeted to K–12 teachers who use the Internet and/or online services in the classroom. Recent issues have explored technology funding, acceptable use policies, lesson plans, and other online resources. Request a free sample copy by sending your snail mail address to connect@wentworth.com (introductory subscription rate is 9 issues for $39) or browse selected highlights at **http://wentworth.com**.

Putting It All Together: An Action Plan

This issue of The ERIC Review *is intended to be a training tool for people who are helping others learn to use telecommunications to improve teaching and learning. We hope it will serve as a useful resource and an invitation for further exploration.*

Tips for Using Computer Networks

■ **It's organized chaos out there.** No one person or organization is in charge of the Internet; it's constantly changing and growing. Reference books, classes, and knowledgeable friends can help you get started. And the more you go online, the more you'll find out about what's out there.

■ **Jump in and get your feet wet.** The best way to learn is through hands-on experience. Try one of the education sites described in this journal.

■ **Don't worry, you can't break anything.** When you tap into another computer, there are limits to what you can do with it. If you press the wrong keys, you'll just get an error message. For example, when you are trying to make a remote connection, there's a chance that your computer might "lock up." If that happens, you just reboot it. If the computer you're trying to connect to is temporarily down, or you key in the wrong address, you might receive the message, "Connection failed."

■ **If a first you don't get in, try, try again.** There are limits to the number of users who can access one specific database, information service, or electronic site at one time. If you can't get through, just try again at another time. You might notice that peak hours are predictable—perhaps everyone tries to get into your favorite site between 9 a.m. and 4 p.m. on weekdays and you'll have better luck getting in earlier, later, or on weekends.

■ **There are a lot of terms, but you don't need to become bogged down in them.** Computer technology is nothing more than another way to connect people and information.

Next Steps

■ Help others find low-cost connections to the Internet (see "Getting on the Internet" on page 7 for ideas).

■ Join a listserv to discuss topics of common interest with your peers. To subscribe, you generally send a message to listserv@*address*. Leave the subject line blank. In the body of the message, type subscribe *listservname firstname lastname*. For example, to subscribe to a listserv on the use of the Internet in education (EDNET@nic.umass.edu):

Address an e-mail message to listserv@nic.umass.edu.

Type subscribe EDNET John Doe.

The following listservs may also be of interest:

Educational technology
EDTECH@msu.bitnet

Elementary and secondary school administration
K12ADMIN@listserv.syr.edu

School library and media services
LM_NET@listserv.syr.edu

School improvement ideas for communities
SATL-CON@listserv.syr.edu

A full list of education-related listservs may be obtained from **ftp.virginia.edu** in the subdirectory *pub/IRD* as file *educatrs.lst*. K–12 listservs are described in another section of the *Internet Resource Directory for Educators*, which can be obtained by FTP file transfer from the same location in the file *IRD-listservs.txt*.

■ Participate in USENET newsgroups, discussion forums on an electronic bulletin board system accessible via the Internet (contact your system operator for specific instructions). Among the thousands of topics available are **k12.chat.teacher** for general discussion among K–12 teachers and **k12.ed.tech** on technology education.

■ Help educators in your community integrate telecommunications into teaching and learning activities and evaluate the effects of this technology on student motivation and achievement.

■ Invite students, parents, business people, and other community members to share their networking expertise with the schools.

ERIC Directory

Educational Resources Information Center (ERIC)
U.S. Department of Education
Office of Educational Research and Improvement (OERI)
555 New Jersey Avenue NW
Washington, DC 20208–5720
Telephone: (202) 219–2289
Internet: eric@inet.ed.gov

Clearinghouses

Adult, Career, and Vocational Education
The Ohio State University
1900 Kenny Road
Columbus, OH 43210–1090
Toll Free: (800) 848–4815
Telephone: (614) 292–4353
Internet: ericacve@magnus.acs.ohio-state.edu

Assessment and Evaluation
The Catholic University of America
210 O'Boyle Hall
Washington, DC 20064
Toll Free: (800) 464–3742
Telephone: (202) 319–5120
Internet: eric_ae@cua.edu

Community Colleges
University of California at Los Angeles
3051 Moore Hall
Los Angeles, CA 90024–1521
Toll Free: (800) 832–8256
Telephone: (310) 825–3931
Internet: eeh3usc@mvs.oac.ucla.edu

Counseling and Student Services
University of North Carolina at Greensboro
School of Education
101 Park Building
Greensboro, NC 27412–5001
Toll Free: (800) 414–9769
Telephone: (919) 334–4114
Internet: ericcass@iris.uncg.edu

Disabilities and Gifted Education
Council for Exceptional Children
1920 Association Drive
Reston, VA 22091–1589
Toll Free: (800) 328–0272
Telephone: (703) 264–9474
TDD: (703) 264–9449
Internet: ericec@inet.ed.gov

Educational Management
College of Education
1787 Agate Street, Room 100
5207 University of Oregon
Eugene, OR 97403–5207
Toll Free: (800) 438–8841
Telephone: (503) 346–5043
Internet: ppiele@oregon.uoregon.edu

Elementary and Early Childhood Education
University of Illinois
805 West Pennsylvania Avenue
Urbana, IL 61801–4897
Toll Free: (800) 583–4135
Telephone: (217) 333–1386
Internet: ericeece@ux1.cso.uiuc.edu

Higher Education
The George Washington University
One Dupont Circle NW, Suite 630
Washington, DC 20036–1183
Toll Free: (800) 773–3742
Telephone: (202) 296–2597
Internet: eriche@inet.ed.gov

Information & Technology
Syracuse University
4–194 Center for Science and Technology
Syracuse, NY 13244–4100
Toll Free: (800) 464–9107
Telephone: (315) 443–3640
Internet: eric@ericir.syr.edu
AskERIC (Internet-based question-answering service): askeric@ericir.syr.edu

Languages and Linguistics
Center for Applied Linguistics
1118 22nd Street NW
Washington, DC 20037–0037
Toll Free: (800) 276–9834
Telephone: (202) 429–9292
Internet: eric@cal.org

Reading, English, and Communication
Indiana University
Smith Research Center, Suite 150
2805 East 10th Street
Bloomington, IN 47408–2698
Toll Free: (800) 759–4723
Telephone: (812) 855–5847
Internet: ericcs@ucs.indiana.edu

Rural Education and Small Schools
Appalachia Educational Laboratory
1031 Quarrier Street
P.O. Box 1348
Charleston, WV 25325–1348
Toll Free: (800) 624–9120
Telephone: (304) 347–0400
Internet: lanhamb@ael.org

Science, Mathematics, and Environmental Education
The Ohio State University
1929 Kenny Road
Columbus, OH 43210–1080
Toll Free: (800) 276–0462
Telephone: (614) 292–6717
Internet: ericse@osu.edu

Social Studies/Social Science Education
Indiana University
Social Studies Development Center
2805 East 10th Street, Suite 120
Bloomington, IN 47408–2698
Toll Free: (800) 266–3815
Telephone: (812) 855–3838
Internet: ericso@indiana.edu

Teaching and Teacher Education
American Association of Colleges for Teacher Education
One Dupont Circle NW, Suite 610
Washington, DC 20036–1186
Toll Free: (800) 822–9229
Telephone: (202) 293–2450
Internet: ericsp@inet.ed.gov

Urban Education
Box 40, Teachers College
Columbia University
New York, NY 10027–6696
Toll Free: (800) 601–4868
Telephone: (212) 678–3433
Internet: eric-cue@columbia.edu

Adjunct Clearinghouses

Art Education
Indiana University
Social Studies Development Center
2805 East 10th Street, Suite 120
Bloomington, IN 47408–2373
Toll Free: (800) 266–3815
Telephone: (812) 855–3838
Internet: ericso@indiana.edu

Chapter 1 (Compensatory Education)
Chapter 1 Technical Assistance Center
PRC, Inc.
2601 Fortune Circle East
One Park Fletcher Building, Suite 300–A
Indianapolis, IN 46241–2237
Toll Free: (800) 456–2380
Telephone: (317) 244–8160
Internet: prcinc@delphi.com

Child Care
National Child Care Information Center
301 Maple Avenue West
Vienna, VA 22180
Toll Free: (800) 616–2242
Telephone: (703) 938–6555
Internet: agoldstein@acf.dhhs.gov

Clinical Schools
American Association of Colleges for Teacher Education
One Dupont Circle NW, Suite 610
Washington, DC 20036–1186
Toll Free: (800) 822–9229
Telephone: (202) 293–2450
Internet: iabdalha@inet.ed.gov

Consumer Education
National Institute for Consumer Education
207 Rackham Building, West Circle Drive
Eastern Michigan University
Ypsilanti, MI 48197–2237
Toll Free: (800) 336–6423
Telephone: (313) 487–2292
Internet: nice@emuvax.emich.edu

ESL Literacy Education
Center for Applied Linguistics
1118 22nd Street NW
Washington, DC 20037
Telephone: (202) 429–9292, Extension 200
Internet: ncle@cal.org

Law-Related Education
Indiana University
Social Studies Development Center
2805 East 10th Street, Suite 120
Bloomington, IN 47408–2698
Toll Free: (800) 266–3815
Telephone: (812) 855–3838
Internet: ericso@indiana.edu

Test Collection
Educational Testing Service
Princeton, NJ 08541
Telephone: (609) 734–5737
Internet: mhalpern@rosedale.org

U.S.-Japan Studies
Indiana University
Social Studies Development Center
2805 East 10th Street, Suite 120
Bloomington, IN 47408–2698
Toll Free: (800) 266–3815
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Rockville, MD 20850–4305
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